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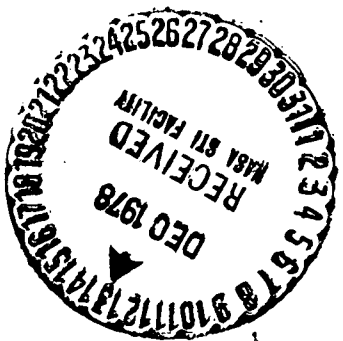

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WOMEN COMPLETE SPACE TESTS

Numerous programs are carried out at NASA centers in a continuing effort to find out how people adapt to conditions approximating those encountered in space. Risks must be defined and remedies invented before Earth dwellers can reside and work for long periods in the alien atmosphere of an orbiting spacecraft.

In November, eight women volunteers in the 45-to-55 age group emerged hale and hearty after nearly a month spent doing complex and rigorous tests, isolated from personal contact with friends and family, at the Human Research Center at NASA's Ames Research Center, Mountain View, Calif.

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The group, like some 40 other men and women aged 25 to 55 who have offered their services to the space program since 1973, served as participants in a study designed to assess the effects of weightlessness on the human body. Of particular importance to the researchers are measurements of the tolerances and responses of the body as it reenters the gravity-laden atmosphere of Earth after experiencing the zero gravity of space. The test group helped simulate such conditions.

The long-term NASA experiment, informally known as the "Bed Rest Program" will be completed probably in the next 12 months as two more groups -- eight men, then eight women, all in the 55 to 65 age bracket -- undergo the same tests as the earlier subjects.

The reason for using bed rest to measure bodily responses is that prolonged horizontal bed rest is one way by which a physiological approximation of the zero gravity experienced in space can be achieved on Earth. Bodily changes begin within 24 to 48 hours after total bed rest begins and continue to develop throughout the subsequent days of the program.

Once zero gravity has been approximated, medical researchers can study human responses to the introduction of both normal and abnormal Shuttle reentry gravity forces.

Other tests assess the value of anti-gravity suits as a protection against the stresses experienced during reentry. That is a cooperative study series with NASA's Johnson Space Center, Houston, Texas.

By now, the selection system for the program is well-established at the Ames center. At the start of each segment, a preliminary selection is made from among some 200 volunteers in a specific age group in response to newspaper advertisements run in the sports or society pages. This very successful gambit was instigated by Lynne Dunham at Ames who screens the subjects and makes a preliminary selection.

The individuals are given a series of exacting physical and psychological tests each day for a week, short orientation rides on the human centrifuge at differing speeds and are put through lower-body, negative pressure tests for evaluation of blood and heart functions. In short, to qualify for the full experiment, subjects must first pass tests demonstrating that their circulatory system functions well, that they have no blood defects and that they have good lung functions.

Applicants also must demonstrate an ability to withstand and operate efficiently within centrifuge boundaries ranging from the gravity rates experienced on Earth to multiple gravitational forces.

At the upper extreme, the force of gravity is about equal to that exerted when an aircraft executes extremely sharp turning maneuvers at high speeds.

Subjects also learn to fly a flight simulator in a sitting position and lying down, since during the bed rest study all test procedures are done from a supine position.

At all times, medical personnel keep a sharp eye on actions and reactions. Individuals can halt the testing any time they choose. Volunteers are repeatedly told what they can expect, the reasons for the various procedures and the philosophy behind the research program.

Nobody has suffered any serious physical changes. Most said that discomfort and boredom were their only adverse reactions, but that the chance of participating in a space program more than made up for such minor distress. The extent of risk is considered minimal on the basis of testing to date. Medical examinations afterward have disclosed only minor differences in reactions of age groups and sexes.

The three-phase study begins when the eight subjects move into the 12-bed research facility at Ames. After a nine-day control period, 10 days of total bed rest begin, followed by a five-day recovery period with the volunteers in an ambulatory status but still confined.

Rules are strict as tests advance. Participants must stay flat constantly during bed rest experimenting, no cheating allowed. About the only variation on the flat-on-back rule is that subjects can prop up their heads at a slight angle to eat. Even showers are taken in a horizontal position in a specially developed shower into which a subject is moved via a wheeled gurney that slides under a bank of nozzles. Medical supervision is constant.

No visitors are allowed though incoming and outgoing telephone calls may be made. No smoking, no alcoholic beverages, no candy or snacks, no drugs or medication unless prescribed by the attending physician, no dieting, no deviation from three meals a day with lights off at 11 p.m., on at 7 a.m.

At times the lower body is placed in a box for negative pressure tests, which measure the amount of blood flow through the legs as pressure is lowered within the box. The test also measures the size of the heart and how fast it squeezes blood into extremities. Numerous blood samples are taken each day, as well as deep body temperatures. Electrocardiograms constantly record the heart rates of each individual, even during sleep. A "biobelt" worn constantly around the waist contains antennae that send data to recorders in another room.

Centrifuge rides take place before and during bed rest, which are designed to measure reflexes and coordination as the body makes its adjustments to the strange circumstances.

Every effort is made at the Ames facility to keep the subjects cheerful and relieve the natural boredom that sets in after the initial excitement has subsided. Surroundings are painted in bright corals and yellows with colorful wall decorations. Many books and games are at hand and each of the beds is equipped with stereo and color television. Rooms (two participants in each) are soundproof.

The residential area contains a lounge, recreation and dining areas, a kitchen, several bathrooms and a nursing station with phone communication to each bed. The food is well prepared, nourishing and attractively served.

Facility manager Dee O'Hara's (R.N.) long experience with astronauts causes her to be extra sensitive to the discomforts of long confinement in cramped quarters, so she strives for cheerful upbeat surroundings. Even the jumpsuits provided for the women while they are ambulatory are fashioned from colorful fabrics.

Medical attendants (doctors, nurses and technicians) are on hand at all times, and remote monitoring of physiological functions provides continuous recorded data about each subject. All these factors combine to reassure the volunteers and to make them feel safe and comfortable. They also know they can withdraw at any time -- but only one person has ever dropped out of the test series, a withdrawal caused by family difficulties.

The latest set of recruits, all Californians, to come through with flying colors were: Eleanor Belton, 52, supervisor at an engineering company; Barbara Goddard, 48, housewife; Dale Graves, 53, pilot and retired Navy captain; Mary Ellen Joseph, 49, housewife; Diana Larsen, 45, housewife; Madelyn Luthi, 55, housewife; Bernice Robertson, 51, chief of a maternal-child health board; and Joanne Walsh, 51, court reporter and housewife.

Like all the others, the women were cheerful and enthusiastic ("superb, highly motivated," said Nurse O'Hara), several saying they were eager to join in similar NASA experiments again. The same reactions have been voiced by other volunteers, some of whom call the Ames center regularly to offer their services.

The medical research program is conducted by members of the Biomedical Research Division at Ames, under the direction of Harold Sandler, M.D. He is assisted by Danielle Goldwater, M.D. Ralph Pelligra, M.D., is the medical qualifying officer for the candidates. Facility manager Dee O'Hara was the nurse on all NASA's manned space missions, from the Mercury program to the Apollo Soyuz Test Program.

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